REMARKS

Applicants thank the Examiner, Mr. Duong, for his courtesy and assistance in advancing the prosecution of this application during an interview conducted October 27, 2004. The following is a summary of the matters which were discussed during the interview.

In response to the objection to Claim 1 on formal grounds, the penultimate paragraph of Claim 1 has been amended in the manner suggested by the Examiner. Accordingly, reconsideration and withdrawal of this ground of rejection are respectfully requested.

Claims 1, 3-4 and 10-12 have been rejected under 35 U.S.C. §102(e) as anticipated by Benz et al (U.S. Patent No. 6,187,066), while Claims 2, 5-9 and 13 have been rejected under 35 U.S.C. §103(a) as unpatentable over Benz et al. However, for the reasons set forth hereinafter, Applicants respectfully submit that all claims of record in this application distinguish over Benz et al, whether considered separately, or in combination with other references of record.

The present invention is directed to a method of operating a gas generating system of the type which is used to generate fuel (for example, hydrogen) for the operation of a fuel cell system. Since gas generation systems, such as systems for steam reforming of hydrocarbon containing starting materials, are generally endothermic, it is necessary to provide heat for their

operation. (The cited Benz et al reference is an example of a heating arrangement of this type.) Moreover, when the gas generating unit is initially operated following a period of inactivity, it is necessary to bring it to operating temperature in order to sustain the endothermic reforming reaction.

The invention provides a method of operating a gas generating device which brings the system to a proper operating temperature quickly, and therefore exhibits improved cold starting properties. It does so by providing a bifurcated system which includes at least two gas generation units. The first gas generation unit has a lower thermal mass than the second gas generation unit, and during a starting phase only the first gas generation is operated (with heat being supplied from an external source). Due to its low thermal mass, the first unit rises to operating temperature rapidly, and as it does, the heat from the gases flowing from that unit to the second gas generation unit heat the latter up as well. Moreover, in order to hasten the heating of the first gas generation unit even further, during the starting phase, it is operated with a power and/or at a temperature which exceeds the rated values which are encountered in normal operation of the gas generation device.

The Benz et al reference, on the other hand, differs fundamentally from the invention in that it discloses neither a gas generation system nor a method of operating a gas generating system. Rather, as indicated at Column 1, lines 6-7 Benz et al relates to "a device for providing heat energy for a gas-generating

system...", or in other words a heater. For this purpose, it includes a series of combustion chambers in which an input fuel is burned to generate heat to support a gas generating system. Accordingly, the Benz et al apparatus corresponds to the burner units 12a, 12b of the present invention, as depicted in Figures 1 and 2. (See, for example, Abstract, line 1, col. 1, lines 1-2 and 51-53; and col. 2, line 40.)

The term "gas generating device" or "gas generating system" is a term of art which is well understood by those skilled in the field of fuel cell technology, and refers specifically to devices for generating a gaseous fuel (typically hydrogen) for operation of a fuel cell system. The system according to the invention, as depicted in Figs. 1a and 1b, for example, includes two such "gas generation units" 2a, 2b which generate a hydrogen-rich by steam reformation of a fuel, such as methanol. (See paragraph [0017], first two sentences). The output of such a system is a hydrogen rich gas flow. By way of contrast, the Benz et al. reference includes no such gas generating units as elements 2a and 2b in the present invention; rather, the components 2-4 comprise combustion chambers for catalytic oxidation of a fuel for the purpose of generating heat (col. 2, lines 44-47), which is provided to a "device to be heated" by means of a heat exchanger. (See col. 3, lines 1-6). Accordingly, unlike a gas generator, the output of the central heating device according to Benz et al. is simply heat, with the exhaust gases being avented to the environment through a line 6 as waste. (See col. 3, lines 24-33).

The distinction between gas generating systems on the one hand and heating systems, such as disclosed in Benz et al., is clearly understood in the field of fuel cell technology. Thus, for example, as noted previously, the Benz et al reference itself states that it is directed to "a device for providing heat energy for a gas generating system...". Similar references appear throughout the text. Moreover, at Column 3, lines 6-7 Benz et al indicates that, "the device to be heated can be a reformer or an evaporator for example". Thus, while Benz et al. discloses a heating device which may be used to supply heat to, among others, a gas generating system (which generally requires the input of heat energy to support the chemical reaction), none of the disclosure contained in Benz et al. suggest anything regarding in a manner in which a gas generation device of the type specified in claim 1 might be operated. Since claim 1 defines a method for operating a gas generation device, it is not anticipated by Benz et al. within the mean 35 USC §102(e).

In addition, Benz et al fails to disclose that, during the starting phase, a first gas generation unit is operated "with a power $P_{start\_1}>P_{rated\_1}$ or at an operating temperature $T_{start\_1}>T_{rated\_1}$". In other words, during the starting phase, the first gas generation unit is operated in an "overload" state in which the amount of gas generated exceeds its rated capacity for steady state operation. (See paragraph [0022], lines 4-9.) As discussed at paragraph [0024], such operation is achieved by elevating the temperature of the first gas generation unit 2a to a level of 300°C, which exceeds it's rated operating temperature T_{rated_1}

of 280°. (See paragraph [0024] and [0025]. See also paragraph [0022], the last three lines.) Although constant operation of the first gas generation unit 2a at such a temperature and power output level is not possible during normal study state operation, it permits the first gas generation unit to chemically react a quantity of gas corresponding to an output of 40 kilowatts (10 kilowatts greater than it's rated capacity) during the start up period.

The Benz et al. reference contains no disclosure that would suggest such operation of a gas generating unit. Aside from the fact that Benz et al. does not disclose anything concerning the gas generating unit which the structure disclose therein might be used to heat, it's also true that it contains no disclosure which would suggest such an overload operation of a burner device, either. In this regard, Applicants note that the specification in col. 3, lines 49-53, cited in the Office Action with regard to this feature of the invention refers only to the fact that "a reduced quantity of fuel/air mixture is conducted through the cold and start component 3" during a cold start. Nothing contained in this portion of the disclosure, or elsewhere, suggests operation of a burner at a temperature at a level and power output which exceeds its rated capacity, as recited in claim 1.

Finally, Benz et al contains no disclosure which teaches or suggests that the thermal mass of the first gas generation unit is lower than the thermal mass of the second gas generation unit. In this regard, Applicants respectfully submit that the term "thermal mass", as used in the specification, is well understood by

those person skilled in the art of heat transfer, to refer to a property that determines the amount of heat required to increase the temperature of a particular component by a set amount. The use of the term "thermal mass" in the specification of the present application is fully consistent with that understanding. Thus, for example, at paragraph [0005] the specification states that prior art reactors "have a high thermal mass, and therefore need a very long time to be heated to a predetermined operating temperature". In other words, both the type and amount of materials used to manufacture them are such that a large amount of heat is required to raised their temperature. Similarly, at page 8, paragraph [0023], lines 5-7, the specification further states that because the gas generation unit according to the invention has a lower thermal mess, "it can be bought up to a required operating temperature more quickly in the event of a starting operation".

In addition to the foregoing, the dependent claims of the present application provide additional distinguishing features as well. In Claim 2, for example, the first gas generation unit is operated only when the required power exceeds the rated power P_{rated_2} of the second gas generation unit. This limitation, of course, has increased significance in a gas generation system such as recited in the claims of the present application, in which the required fuel output varies immediately and directly with the required power output from the fuel cell unit. Claim 3, on the other hand, recites that the first gas generation unit is supplied with at most a quantity of operating medium which corresponds

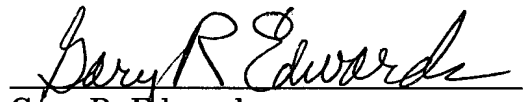
to an instantaneously required power. In addition, Claim 7 recites that upon occurrence of a predetermined load rise, the first gas generation unit "is supplied with oxygen containing medium for a predetermined time". Claims 8 and 9 recite that the first gas generation unit is supplied with oxygen containing medium "when a required power exceeds the rated power P_{rated_2} of the second gas generation unit". Claim 10, on the other hand, recites that the system according to the invention further comprises means for keeping the first gas generation unit warm during operational pauses. Finally, Claim 13 recites that after the starting phase is ended in the case of low or medium loads, only the second gas generation unit is operated, with the first gas generation unit being operated only when the required power exceeds the rated power of the second generation gas unit.

Insofar as Applicants have been able to determine, the latter features of the invention as recited in the above-mentioned dependent claims are neither taught nor suggested by Benz et al.

In light of the foregoing remarks, this application should be in condition for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #1748X/49969).

Respectfully submitted,



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